

### BACKGROUND OF THE INVENTION

The present invention relates to a melt-blowing head and method for supplying in a controlled manner either one or more polymeric materials to a melt-blowing die, either separately from one another or in a mixture thereof.

As known, the so-called melt-blown material, comprise a mass of polymeric material fibrils (for example polyolefine polymers, polyester polymers and copolymers thereof), extruded from a melt-blowing head having an extruding die and by using pressurized hot air jets.

Prior melt-blowing heads are conventionally provided with at least a suitably contoured inner chamber, receiving the mass of the polymeric material fed or supplied through an inlet channel, conveying the polymeric material inside the melt-blowing head.

However, the above mentioned method for supplying the polymeric material, i.e. from the mentioned inlet channel to the holes of the extruding die, does not allow to properly control the distribution of said polymeric material, thereby the polymeric material flow rate is affected by unevennesses, at the melt-blowing die level;

moreover, also the holding time of the polymeric material in the melt-blowing head, and its temperature and pressure, and, in general, all the other operating parameters thereof are subjected to unevennesses.

Accordingly, at the outlet of the melt-blowing die, will be present a polymeric material which, for amount, temperature and melt index will be different from region to region, or through the melting die holes, thereby the fibrils generated by the air jet will have a length and a geometric shape which would be very different from region to region or from an assembly of holes to another assembly of holes of the die.

Accordingly, the end product (for example a non-woven fabric) formed by the mentioned fibrils would have a highly dishomogeneous construction, and, accordingly, uncontrollable chemical, physical characteristics.

This problem would be very serious for non woven fabric materials, of very broad diffusion, which have a lower specific gram weight.

#### **SUMMARY OF THE INVENTION**

Accordingly, the aim of the present

invention is to provide a novel melt-blowing head and method specifically designed for providing a properly controlled supplying of the polymeric material from the melt-blowing head inlet to the outlet of said polymeric material from the melt-blowing die.

Within the scope of the above mentioned aim, a main object of the present invention is to provide a melt-blowing head and method adapted to properly control the polymeric material flow-rate up to the melt-blowing die, to allow said polymeric material to be held inside the melt-blowing head for a holding time much less than that of prior melting heads, with a less risk of degrading said polymeric material.

The above mentioned aim and object of the present invention, as well as yet other objects, which will become more apparent hereinafter, are achieved by the melt-blowing head and method as claimed in the accompanying claims.

Further features of the inventive melt-blowing head and method are defined in the dependent claims.

With respect to prior melt-blowing heads and method, the inventive melt-blowing head and

method provide the advantage that they allow to properly control the polymeric material flow and distribution inside said melt-blowing head, thereby reducing to a minimum the holding time of said polymeric material in said melt-blowing head, and also reducing to a minimum possible degrading risks of said polymeric material.

Owing to the inventive melt-blowing head and method, in particular, the polymeric material will be supplied through a like distance from the inlet hole of the head up to any desired holes of the melt-blowing die.

Thus, the polymeric material will be provided with the same heat amount and driving energy.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

The above mentioned advantages, as well as further advantages and features of the present invention, will become more apparent hereinafter from the following detailed disclosure of a preferred embodiment of the melt-blowing head and method according to the invention which are illustrated, by way of an exemplary but not limitative example, in the figures of the accompanying drawings, where:

Figure 1 is a cross-sectional view illustrating a prior melt-blowing head:

Figure 2 is a longitudinal cross-sectional view illustrating the melt-blowing head shown in figure 1;

Figure 3 is a cross-sectional view illustrating a melt-blowing head according to the present invention;

Figure 4 is a further longitudinal cross-sectional view illustrating the melt-blowing head of figure 3; and

Figure 5 illustrates a further modified embodiment of the melt-blowing head according to the present invention.

#### **DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Figure 1 schematically illustrates, at the reference number 1, a melt-blowing head of conventional type.

Such a prior melt-blowing head 1 comprises an inlet 2 for the polymeric material to be melt-blown, a polymeric material delivery or distributing channel 3, a filter 4, a melt-blowing die 5 as well as channels 6 for supplying hot air.

At the outlet of the holes 7 of the melt-

blowing die 5, a plurality of fibrils 8 will be obtained by spraying.

As clearly shown in figure 2, the above mentioned polymeric material delivery channel 3 is widened in the form of a narrow chamber 9, in which the polymeric mass supplied to a pre-die or filter 4 and then to the die 5 is expanded.

Thus, the path of the polymeric material from the inlet 2 to the die holes 7 would be a random and uncontrolled path.

Then, it should be apparent that this lacking of properly controlling the supplying of the polymeric material from the inlet 2 to the die 5 holes 7 would generate variations in the flow of the polymeric material, due to the different holding time in which said polymeric material is held in the chamber 9.

Accordingly, the polymeric material will be subjected to an uncontrolled thermal processing, very different from that would be necessary and desired.

Moreover, the above mentioned different time and temperature would generate a degradation of the polymeric material, which will have a different melt index or fluidity, and a different flow rate

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through the melt-blowing die.

Thus, fibrils will be generated having different chemical-physical characteristics (for example length, cross-sections, consistency and so on, which would provide an end product (for example a non-woven fabric) with dishomogeneous properties (such as toughness, felting, thickness and so on).

The melt-blowing head according to the present invention has been indicated by the reference number 10 in figures 3 and 4.

Said melt-blowing head comprises a polymeric material inlet channel 11, the polymeric material being supplied by a geared volumetric or displacement pump 12.

Said pump, in turn, will drive the polymeric material inside two main channels 13 and 14, having like shapes and size, from which extend the polymeric material delivering channel arrangement, having a tree construction which will be disclosed in a more detailed manner hereinafter.

At the end of the main arm 13 therethrough the polymeric material is supplied to the melt-blowing die, i.e. on the first knot 15 of the above mentioned tree construction, extend two secondary

side arms or branches 16 and 17, whereas, at the end portion of the other main branch or arm 14, i.e. at the level of the knot 18 thereof corresponding to said knot 15, extend other two secondary side arms or branches 19 and 20, having the same shape and size as the mentioned branches or arms 16 and 17.

In particular, said branches 16, 17 and 19, 20 have, in the embodiment being illustrated, a substantially L-shape with the vertical leg downward directed, in the direction of the die 34 of the melt-blowing head 10.

On the respective end portions 21, 22, 23 and 24 of the above mentioned branches, forming middle branches or arms of the polymeric material delivery channel arrangement, are formed corresponding knots of the tree construction, therefrom respective secondary side branches 25,26; 27,28; 29,30 and 31,32 extend.

The above mentioned branches are equal to one another for shape and size and have the same L-shape extension as that of the branches 15, 17 and 19, 20, as above disclosed.

As shown, the polymeric material delivery channel extends, with a like tree construction, up to

the holes 33 of the die 34 therefrom the fibrils are extruded.

Owing to the above disclosed polymeric material supply channel arrangement, for supplying the polymeric material to the melt-blowing die, to each of the  $n$  holes 33 of the die 34 will correspond a specifically designed path which, for shape and size, would be like to all the other path arrangements joining the polymeric material inlet channel 11 to other fibril extruding holes 33.

Owing to the above disclosed construction of the polymeric material delivery channels, the holding time in which the polymeric material is held in the path from the inlet 11 to the holes 33 will be the same for all the die holes, thereby providing a homogeneous distribution of said polymeric material inside said melt-blowing head.

Thus, the polymeric material at the outlet of the holes 33 will be provided with the same heat amount and driving energy or power, thereby allowing to make, at the outlet of the die 34, a plurality of fibrils having mutually homogeneous chemical and physical properties.

In the modified embodiment shown in figure

Each of said pumps will in turn supply the corresponding polymeric material to a respective delivery channel 41, 42 and 43 having the tree construction disclosed with reference to figure 3.

The invention, as above disclosed and illustrated, is susceptible to several modifications and variations without departing from the inventive scope; for example, the tree construction polymeric material delivery channel arrangements can be further properly modified in their geometric and configuration parameters.